

## **Development of a Matrix for Classifying Injuries According to their Nature and Body Region**

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To facilitate uniform reporting of injuries by their nature and body region, a matrix classification of ICD-9 N-codes is proposed. The proposed grouping of ICD codes according to the two axes of the matrix (Axis A: Body Region and Axis B: Nature of Injury) is attached. These groupings were defined to be compatible with the ICD-10. Also, the groupings were defined assuming that only four digit ICD codes were available as many databases (e.g., emergency department and ambulatory care data, vital statistics and some hospital discharge data) do not use a fifth digit. A modified classification is also presented when injuries are classified using only the three digits of the ICD. More refined classifications are possible when more information (i.e., a fifth digit) is available. The proposed classification encompasses all ICD codes 800-999. For several categories (e.g., poisonings, late effects etc.), however, the two way classification is not applied or irrelevant.

*Axis A: Body Region: Region Classification.* Injuries are classified into the following categories using the rules accompanying the attachment:

- Skull and Brain
- Front of Neck (excl. Spine)
- Thorax
- Abdomen, incl. Pelvic Contents and Genital Organs
- Spine and Back
- Upper Extremity
- Lower Extremity and Bony Pelvis excluding Neck of Femur
- Neck of Femur
- Other and Ill-Defined Body Region
- Foreign Bodies
- Poisonings
- Toxic Effects
- Other and Unspecified Effects of External Causes
- Late Effects
- Early Traumatic Complications
- Complications of Surgical and Medical Care

*Axis B: Nature of Injury:* Injuries are classified into the following categories using the rules accompanying the attachment:

- Fractures
- Dislocations
- Sprains and Strains
- Cursing Injury

- Amputation of Limbs
- Injuries to Internal Organs (incl. CNS injuries)
- Nerves
- Blood Vessels
- Open Wounds
- Superficial Injuries
- Contusions
- Burns
- Effects of Foreign Bodies
- Injury (physical) - other and unspecified
- Poisonings
- Toxic Effects
- Late Effects
- Early Complications of Trauma
- Complications of Surgical and Medical Care

In comparing this matrix to the matrix proposed from Israel by Barell and colleagues, many similarities are apparent. They both group ICD codes by nature of the injury and body region. Barell's matrix, however, relies on the coding of injuries using all five digits of the ICD-CM. The resulting matrix includes more categories and a more refined classification by both nature and body region. It cannot be used, however, when fifth digit ICD coding is not available.

With some refinement of both matrix classifications, one unified approach could be developed in such a way that the more refined classification would be collapsible into the broader categories. Then, depending on the application and the characteristics of the database available, users could choose to summarize their data using either classification while maintaining uniformity of definitions across studies and countries. Priority should be given to developing this unified approach.

In developing the matrix classification, several issues were raised that need to be discussed more broadly by the ICE committee and recommendations made to assure uniformity in the application of the matrix. A principal issue that needs to be addressed is the handling of multiple injuries within single body systems or body regions and multi-system injuries. For persons with multiple injuries to a single system, a hierarchy of ICD codes could be established to appropriately assign these individuals to one cell in the matrix. For persons with injuries to multiple body systems, similar rules could be established but may be less acceptable. An alternative would involve using the first listed diagnosis as the basis of classification. Such an approach is problematic, however, as the first listed diagnoses is used in very different ways across databases. Alternatively, the matrix could be constructed to take into account the most common patterns of multiple injury.

Also to be considered is the development of recommendations for the uniform coding and reporting of injury severity across databases. The Abbreviated Injury Scale (AIS) has become the most widely used and accepted measure of injury severity based on anatomic descriptors.<sup>1,2</sup> Several functions of the AIS for measuring overall patient severity across body regions have been introduced in the literature (i.e., the Injury Severity Score (ISS), the Anatomic Profile (AP) and most recently, the New Injury Severity Score (NISS)).<sup>3,4,5</sup> The widespread use of

these measures is constrained, however, because of the time and cost involved in AIS coding. There has long been interest in using the ICD as an alternative to AIS. Several severity classification systems based on ICD have been proposed, although controversy exists regarding their validity. One approach has been the development of a computerized mapping of ICD-9CM rubrics into AIS body regions and severity values.<sup>6</sup> These derived ICD/AIS values can then be used to compute ISS, AP and NISS scores. Severity scoring systems have also been derived directly from ICD coded discharge diagnoses and are therefore independent of the AIS severity classification. Most recently, Rutledge and colleagues have proposed the ICISS score which is derived by multiplying survival risk ratios (SRR) associated with individual ICD diagnoses.<sup>7</sup> Further work is needed to evaluate these alternative strategies so that recommendations could be forthcoming regarding their use.<sup>8</sup>

## References

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4. Thorax <sup>(4,5)</sup>	807.0 - 807.4	**Code 807 under Thorax
	848.3 - 848.4	**Code 848 under Other
	860 - 862	
	875	
	879.0 - 879.1	**Code 879 under Other
	901	
	922.0 - 922.1	**Code 922 under Other
	947.2	**Code 947 under Other
5. Abdomen, pelvic contents, genital organs	863 - 868	
	878	
	879.2 - 879.5	**Code 879 under Other
	902	
	922.2	**Code 922 under Other
	922.4	**Code 922 under Other
	926.0	**Code 926 under Other
	947.3 - 947.4	**Code 947 under Other
6. Spine and Back <sup>(6,7,8)</sup>	805	
	806	
	876 - 877	
	922.3	**Code 922 under Other
	839.0 - 839.5	**Code 839 under Other
	847	
	952 - 953	
7. Upper Extremity	810 - 818	
	831 - 834	
	840-842	
	880 - 887	
	903	
	912 - 915	
	923	
	927	
	943 - 944	
	955	
	959.2 - 959.5	**Code 959 under Other

8. Lower Extremity and Bony Pelvis <sup>(6)</sup>	808	
	821-827	
	835 - 838	
	843 - 845	
	846	
	848.5	**Code 848 under Other
	890-897	
	904	
	916 - 917	
	924	
	928	
	945	
	956	
	959.6 - 959.7	**Code 959 under Other
<b>17. (Neck of femur fracture)<sup>(9)</sup></b>	820	
9. Other and Ill-Defined Body Region	809	
	819	
	828	
	829	
	839.6 - 839.9	** Code 839 under Other
	848.8 - 848.9	** Code 848 under Other
	869	
	879.6 - 879.9	**Code 879 under Other
	911	
	919	
	922.8 - 922.9	**Code 922 under Other
	926.1	**Code 926 under Other
	926.8 - 926.9	**Code 926 under Other
	929	
	941-942	
	946	
	947.8 - 947.9	**Code 947 under Other
	948-949	
	954	
	957	
	959.0 - 959.1	**Code 959 under Other
	959.8 - 959.9	**Code 959 under Other
10. Foreign Bodies	930-939	
11. Poisonings	960-979	
12. Toxic Effects	980-989	

13. Other and Unspec Effects of External Causes	990-995
14. Late Effects	905-909
15. Early Traumatic Complications	958
16. Complications of Surgical and Medical Care	996-999
18. No Injury	000-799

#### Notes to Body Region of Injury Classification

- (1) Include 804 under *Head* (instead of *Multiple Body Regions*) even though it reads: *Multiple fractures involving skull or face with other bones*: assume that principal fracture is to the skull or face.
- (2) Code all injuries to blood vessels of Head or Neck (900) under *Neck*; it is not easy to distinguish whether blood vessel is part of head or neck based only on third or fourth digit of ICD
- (3) Injuries to trachea (typically categorized at 4th or 5th digit) is classified under *Neck* (instead of *Thorax*)
- (4) Injuries to the *trunk* unless otherwise specified are coded under *Other* since these injuries could be to the region of the thorax, abdomen or back
- (5) Fx to larynx and trachea (807.5-807.6) are coded under *Neck* unless rad digit code only, then code under *thorax* and assume injury (fx) is more likely to be to ribs and /or sternum.
- (6) Injuries to sacrum and coccyx are coded under *Spine* as they are typically only distinguishable from other injuries to the spine at the 4th or 5th digits.
- (7) Injuries to buttock region (e.g.. 877) are coded under *Spine and Back*
- (8) Injuries classified under *Neck* include only those injuries to the front of the neck or soft tissue; injuries to the neck portion of the spine are classified under *Spine and Back*
- (9) Neck of femur fractures have been classified separately.

Injury Morbidity Matrix Codes for Nature of Injury  
(Axis B)

1. Fractures <sup>(1,2)</sup>	800-805; 807-829
2. Dislocations	830 - 839
3. Sprains and Strains	840-848
4. Crushing Injury	925-929
5. Amputation of Limbs	885-887; 895-897
6. Injury to Internal Organs <sup>(2,3,4,5)</sup> incl. CNS injuries	860-869 850-854 952-953 806
7. Nerves <sup>(4)</sup>	950-951; 954-957
8. Blood Vessels	900-904
9. Open Wounds <sup>(3,5)</sup>	870-884, 888-894
10. Superficial Injuries	910-919
11. Contusions	920-924
12. Burns	940-949
13. Effects of Foreign Bodies	930-939
14. Other Injury - (other and unspecified)	959
15. Poisonings	960-979
16. Toxic Effects	980-989
17. Other and Unspec. Effects of External Causes	990-995
18. Late Effects of Injuries etc.	905-909
19. Early Complications of trauma	958

20. Complications of Surgical and Medical Care 996-999

21. No Injury No diagnosis codes above 799

#### Notes to Nature of Injury Classification

(1) *Fractures* include skull fractures with intracranial injury; HOWEVER, if data are coded to the fourth digit; include the following codes (i.e., intracranial injuries with skull fx) under Injury to Internal Organs:

800.1 - 800.4	801.1 - 801.4
800.6 - 800.9	801.6 - 801.9
803.1 - 803.4	804.1 - 804.4
803.6 - 803.9	804.6 - 804.9

(2) *Fractures* exclude spine fxs with SCI; they are classified under *Injuries to Internal Organs*;

(3) *Injuries to Internal Organs* include CNS injuries (injuries to the brain and spinal cord); they also include injuries to larynx, trachea, pharynx and thyroid; they do NOT include injuries to internal structures of the eye, ear, and nose (these are included under *Open Wounds*);

(4) *Injuries to Nerves* exclude injuries to nerve roots to spine and spinal plexus (953) -- these are included under *Injury to Internal Organs*;

(5) *Open Wounds* includes injuries to the larynx, trachea, pharynx and thyroid; HOWEVER, if data are only coded to the fourth digit, include codes 874.0-874.5 (i.e., injuries to larynx, trachea, pharynx and thyroid) under *Injury to Internal Organs*.